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157
EVS

TRADITIONAL WATER HARVESTING SYSTEMS

Introduction

Water harvesting system is the collection and storing of rainwater, surface water and ground water according to the local needs (in domestic, livestock, agricultural sectors), geographical and physical conditions. Water harvesting is 7,000 years old concept in India. Indians have developed many water harvesting structures and water conveyance systems specific to their local environment and culture. Evolved over the course of time with collective human experience and efforts, traditional water harvesting systems have satisfied domestic and irrigation needs of the local people in an eco- friendly manner.

historical and archeological evidences, right from Indus
ivilization (3,000 B. C. -1,500 B. C.) to recent times, suggest
stence of effective water harvesting structures and
gement systems. These systems functioned very efficiently in various social, economic and political environments. Some of the traditional water harvesting systems that are practiced even now are described below.

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Bangalore Ahmedabad

Kere

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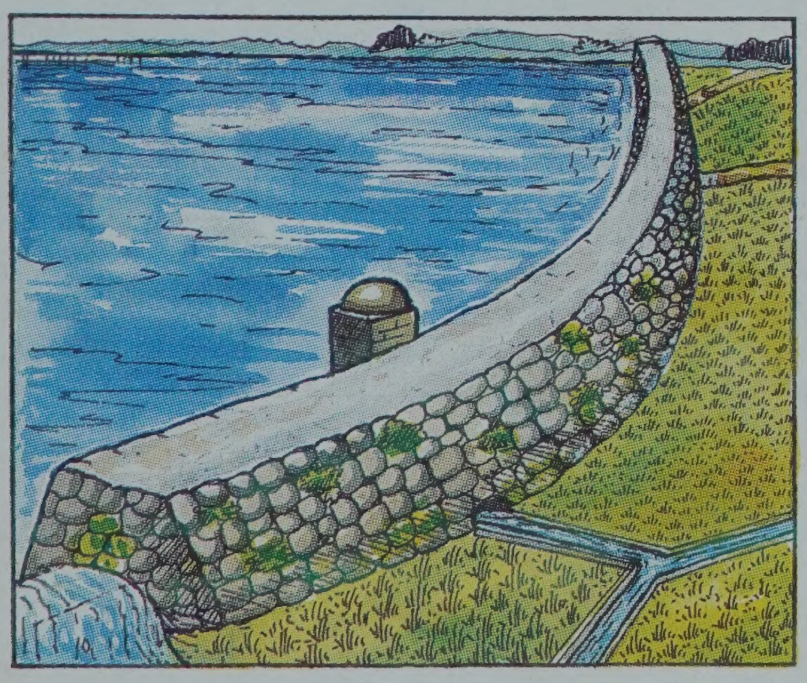
Regional Characteristics: *Kere* is a traditional irrigation structure in the semiarid regions of Deccan Plateau and coastal plains of south India with an average annual rainfall varying from 500mm to1000mm, drought prone areas, flat or gently sloping terrains. It harvests rain water and surface waters from anicuts (dam) built across streams and rivers.



Structure: *Kere* is a large tank with embankment built of stone, cement or mud across the streams with a provision for the overflow of excess water (*kodi* /spillway), outlets for irrigation (*thoobu*) and feeding channels (*kaluve*). The irrigated area under the tank is called *ayacut*. The out flow of one tank supplies water to the next tank all along the course of the stream or river.

Management: These tanks are managed by the village panchayats. The land holding farmers (*ayacutdars*) form a committee and appoint a person (*neerganti*) who is responsible for judicious use and impartial distribution of tank water.

Uses: The *kere* system provides drinking water for humans and livestock and irrigation. Stored water recharges the wells in its

command area and generates income to gram panchyat by the sale of fish annually.

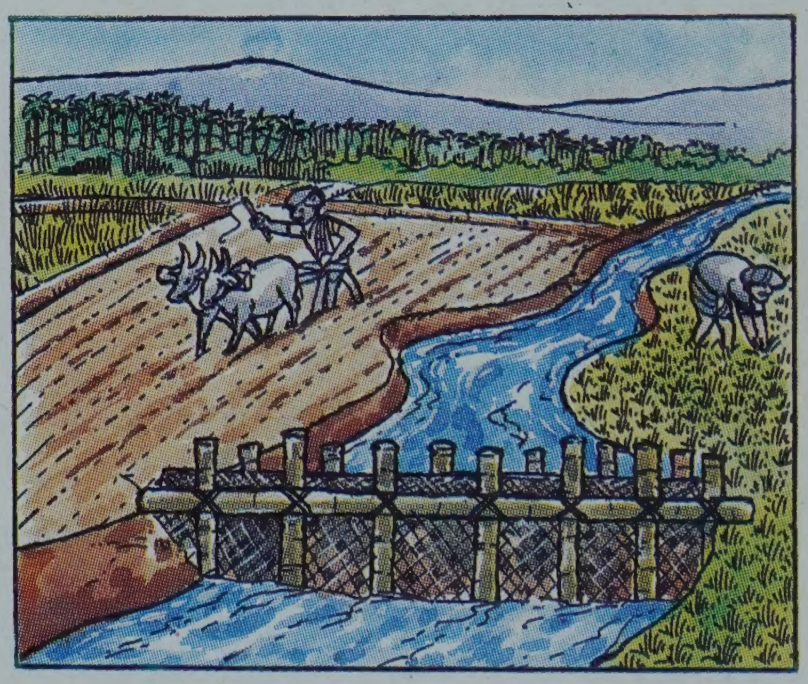
Location: Karnataka, Andhra Pradesh and Tamil nadu account for 54% of the tanks in India. Some are 15 to 16 centuries old. In Karnataka, there are 36,508 *keres.*

Threats: Many *keres* (tanks) are threatened by serious problems of siltation due to deforestation in the catchment areas, lack of funds for repair and management of the tanks, increasing number of tubewells and wells resulting in over exploitation of ground water, encroachment of tank area for cultivation, sewage and industrial pollution in urban areas.

Korambu

Regional Characteristics: This is practiced in the flood prone coastal plains and delta regions of the rivers. This is a surface water harvesting system.

Structure: *Korambu* is a temporary checkdam made up of mud, thatch, timber and grass. It is constructed by horizontally fixing a strong wooden beam touching either banks of the canal. A series of vertical



wooden beams of appropriate height is erected with their lower ends resting firmly on the ground and the other ends tied to the horizontal beam. Closely knitted or matted coconut thatch is tied to this frame. A coat of mud is applied to the matted frame. A layer of grass is also applied carefully which prevents dissolution of the applied mud. *Korambu* is constructed to raise the water level in the canal and to divert the water into field channels. It is so built that excess water flows over it and only the required amount of water flows into the diversion channels. The height of the *korambu* is so adjusted that the fields lying on the upstream are not submerged. Water is allowed to flow from one field to another until all the fields are irrigated. They are built twice a year especially before the onset (May) and end of the monsoon season (October) in order to supply water for during winter and summer season. The first flood washes away the *korambu* and requires to be reconstructed

Management: The beneficiary farmers jointly take up the *korambu* construction. The materials and labour required to construct the *korambu* is contributed by the farmers proportionate to their land holdings.

Uses: Used mainly for irrigation.

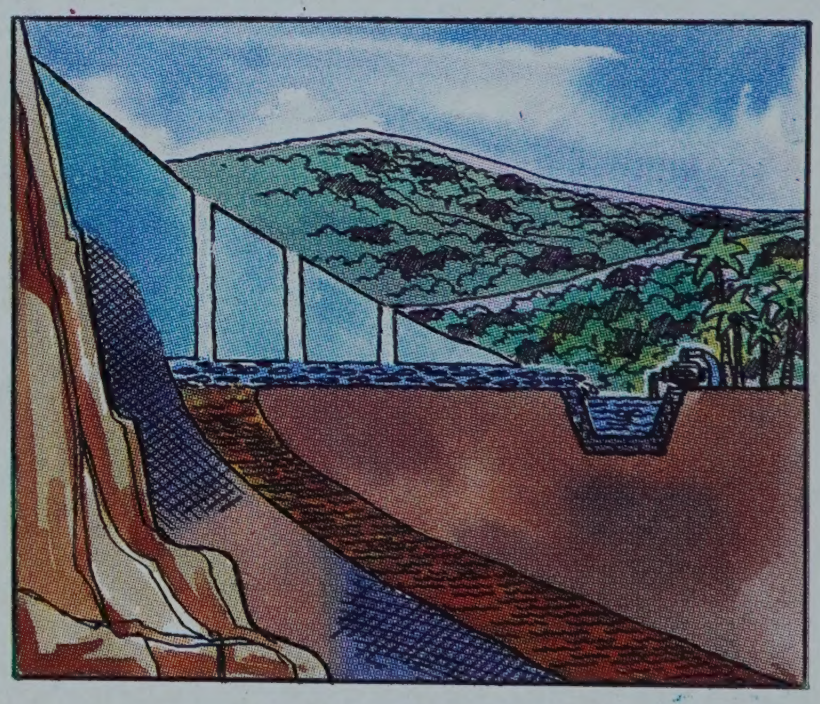
Location: Srirangam and Thanjavur districts of Tamil Nadu. In Kasargod and Thrissur districts of Kerala, *korambu* is known as *chira*.

Threats: This system is being replaced by the concrete checkdams through government intervention, use of energized pumpsets and tubewells, etc.

Surangam

This system is practiced in hilly regions that lie in the windward of rain bearing clouds, with heavy rainfall of about 3500mm, having porous laterite rocks which aid in rain water percolation and abundant ground water resources. *Surangam* is a ground water harvesting system.

Structure: *Surangam* is also called as *thurangam* and *thorapu*.



Surangam is a tunnel dug through a laterite hillock from the sides of which water or moisture seeps out and gets collected in a well, pond or a tank constructed outside the *surangam*. The tunnel is about 0.45 - 0.70 m wide, 1.8 - 2.0 m high and upto 300m long. Secondary *surangams* are also made inside the main tunnel. Depending on the length of *surangam*, a number of vertical air shafts of 2m X 2m dimensions are dug at a distance of 50m to 60m each. This helps to maintain atmospheric pressure inside the *surangam*. The quantity of water derived varies from

10-100 litres per minute. Sometimes, *surangams* tap natural subterranean water. The tunnel excavation proceeds until sufficient amount of water is struck.

A natural problem associated with *surangam* is the 'caving' problem. When the tunnel intercepts a hard rock, there is a layer of lithomorphic clay (loose laterite) which when fully water saturated is liable to cave in. This reduces the yield of *surangam* significantly.

Uses: Used for both drinking and irrigation purposes.

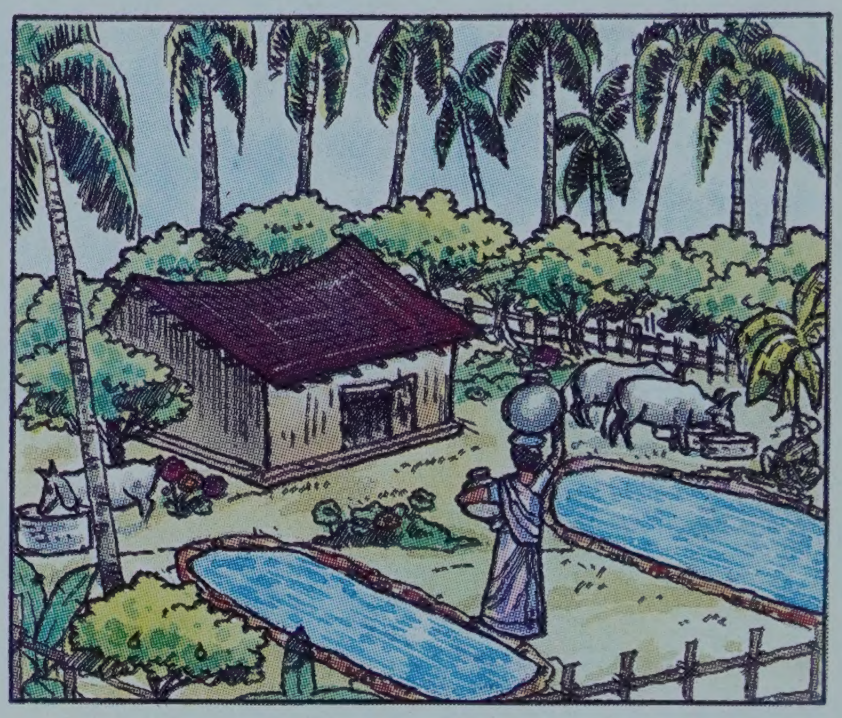
Location: Kasargod district of Kerala, where there are 388 *surangams*.

Threats: *Surangams* could be affected by factors like deforestation leading to rapid runoff, soil erosion and reduced water percolation. Regular evacuation of water from the tunnel is also necessary in order to prevent caving problem due to saturation of the tunnel walls. Pesticide and microbial contamination of ground water table are also possible.

Kulam

Regional Characteristics: *Kulam* system of rain and ground water harvesting is found in places which enjoy a heavy rainfall of about 2500-3500mm per annum, flat and slightly sloping terrain and shallow ground water table.

TRADITIONAL WATER HARVESTING SYSTEMS



Structure: *Kulams* are ponds of varying dimensions. Every household has 1 to 4 small shallow ponds. Separate ponds would be instituted for separate purposes. These ponds required periodic cleaning and attention. However nowadays, people do not use water for drinking purposes.

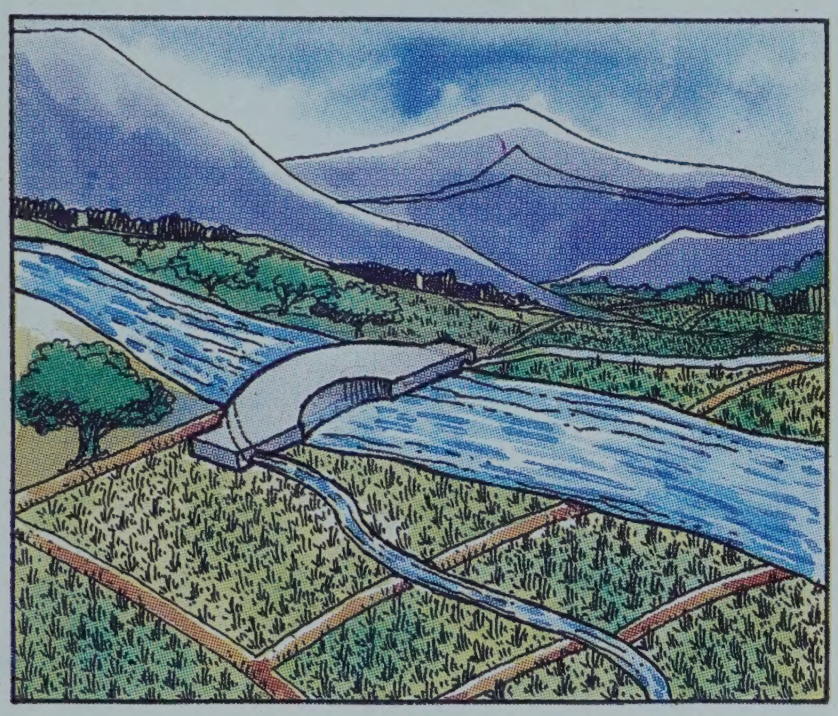
Uses: The water so collected is used for drinking, bathing, flushing and other domestic purposes besides water for gardens in homesteads. Excavation of *kulam* is cheap. It is easily accessible. Even bottom mud (silt) is used as fertilizer for crops. *Kulam* is also used for retting of coconut coir.

Location: *Kulams* are owned individually by every household, found in almost in every coastal district of Kerala.

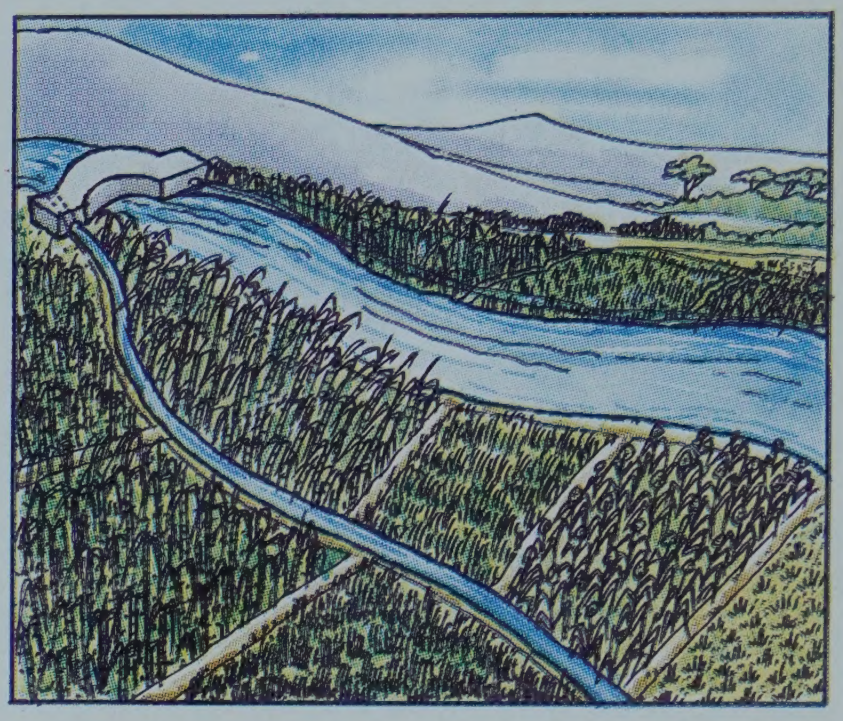
Threats: Water stagnation in *kulam* favors mosquito breeding and spread of water borne diseases. Numbers of *kulams* are decreasing due to the urban water supply, construction of lined wells, disintegration of joint families into small families and fragmentation of agricultural assets.

Phad System

Regional Characteristics: This is practiced in regions with low to moderate rainfall of 500-9100mm, poor underground water and having surface water sources like rivers or streams. This system taps surface water for irrigation purpose.



Structure: The *phad* system of irrigation consists of regularly maintained *bandharas* (earthen or masonry embank- ments) on the rivers to divert water for agricultural use. The *Bandharas* are built either to raise the water level and divert into fields through *kalvas* (canals) or to impound water to form a large reservoir. The length of the canals varies from 2 to12 km. Each canal can discharge about 450 litres per second. This canal is further connected to *charis* (distributaries) which distribute water to different field blocks called *phads*. Further the *charis* are connected to *sarangs* (field channels) which carry water to individual fields. The irrigated areas falling under the *bandharas* are usually divided into four *phads* (blocks) varying 10-200 ha.



Crops like sugarcane, ground nut, wheat, gram, sorghum and rice are grown. The cropping pattern under *phad* system is unique in that, only one type of crop could be grown in one *phad*. Generally sugarcane is grown in one or two *phads* while in others, seasonal crops are grown. In the monsoon, rice or sorghum is grown. The irrigated crops are rotated every year from one *phad* to another. This helps in maintaining the soil fertility and reducing water logging and salinity.

Management: A *patkari* (channel keeper) is appointed to maintain and repair the channels. He is also responsible for distribution of the water proportionate to the land held by each farmer. He is paid in kind, either in terms of grains or a grant of land.

Uses: Used primarily for irrigation.

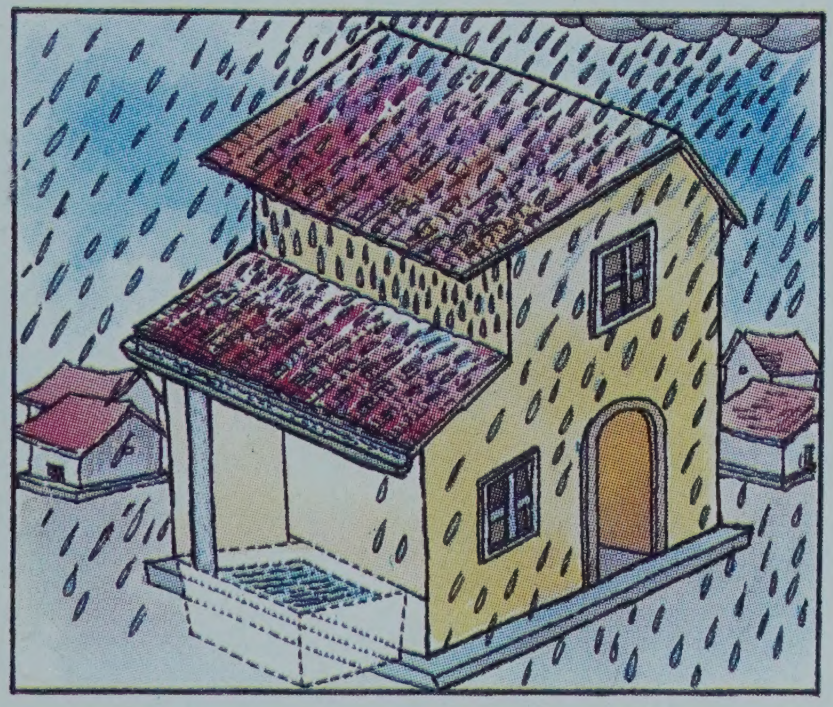
Location: In Dhule and Nashik districts of Maharastra falling in the Deccan Plateau.

Threats: The *Phad* system of irrigation is getting deteriorated owing to construction of dams tapping the rivers which source the channels, shift from mixed cropping pattern to only sugarcane

which requires more water leading to an unprecedented increase in the number of wells and tube wells. Factors like changes in farmers' attitude, lack of financial resources for repair and maintenance have further affected the *Phad* systems seriously.

Tanka

Regional features: This system is found in desert regions which get less than 200 mm of annual rainfall. The soil is sandy, and hence the water holding capacity is very poor, leading to acute scarcity of water resources during summer. *Tanka,* a rain water harvesting system was developed by people several centuries ago.



Structure: Rain water falling from the sloping roofs of houses is conveyed through a pipe into an underground tank called *tanka* built in the main house or courtyard. *Tanka* varies in size, sometimes as big as a room measuring 6 meters deep, 4.5m long and 2.5 m wide. The *tanka* walls are plastered with cement or lime.

Management: *Tanka* is washed and cleaned before the onset of rains. The first spell of rainfall water is not collected as this

would clean the roof and pipes while subsequent rains are collected. Stored water is judiciously used.

Uses: Most reliable source of drinking water in the desert towns especially during summer.

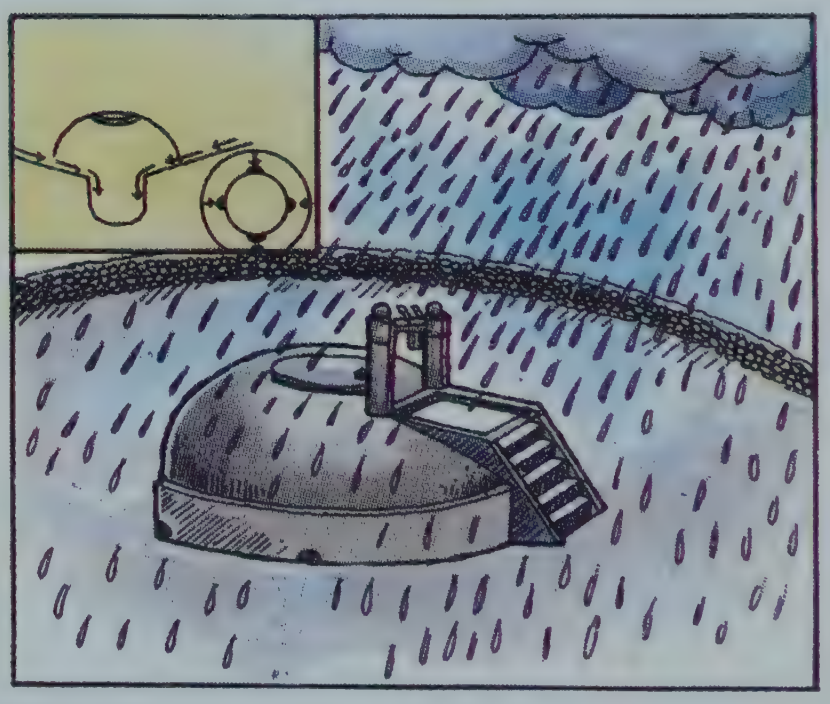
Location: Phalodi, Barmer and Balotra regions of Rajasthan desert. Similar rainwater harvesting is also done in Aizwal of Mizoram State. This is a relatively new technique evolved during 19th century after British colonization.

Threat: This system is slowly disappearing due to urban water supply.

Kund

Regional characteristics: In arid regions where rainfall is scanty and highly variable, ground water table is very deep and salty, *Kund* system of water harvesting is generally found. *Kunds* are common in areas where there is limited ground water and which is salty to taste.

Structure: *Kund* is a huge saucer shaped structure, built of concrete. It has an underground tank covered with a dome at the centre. The underground tank is roughly 6 m deep and 2.5 m



in diameter. The sides of the tank are plastered with lime and ash. The circular catchment is as large as 100 Sq. m, with a smooth slope of 3 to 4% towards the tank. Water is drawn using buckets through an opening at the top of the dome. The opening is always kept closed when not in use. In case of private *kunds*, it is even locked.

Management: *Kund* is cleaned every year before the onset of rains. Cattle grazing and entry with shoes into the catchment area of the *kunds* is strictly prohibited. *Kunds* may be owned by community or individual households.

Uses: For drinking and other domestic purposes.

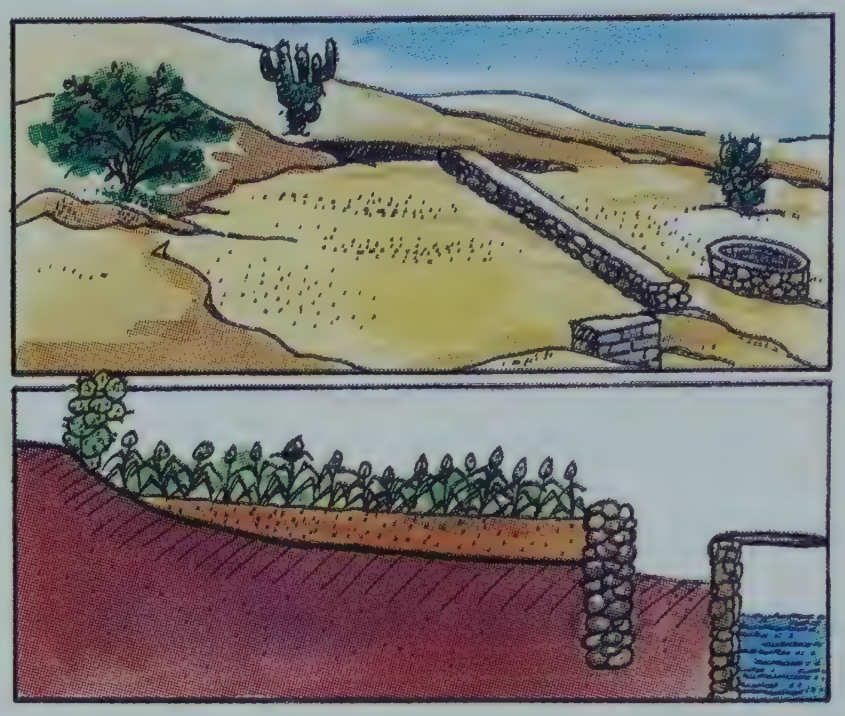
Location: Some desert villages in Bikaner, Jaisalmer districts of Rajasthan.

Threats: *Kunds* are gradually losing their importance due to recent Rajasthan canal construction. Improper maintenance, destruction of catchment area and the underground *kund*, guinea worm infestations due to insanitary conditions are some of the serious problems affecting *kunds*.

Khadin

Regional Characteristics: This system is practiced in hot arid regions characterized by hilly and rocky terrain, sandy, gravely and saline soils, rainfall varying from 140mm to 250mm. Rainfall is torrential and only for a short duration, with high runoff and

no perennial streams. Rain water is harvested in this system on farmland and this water- saturated land is used for crop production. This is essentially a runoff agriculture system.



Structure: The runoff water from the high catchment area is arrested by a bund called *khadin* during monsoon season. Length of the bund is about 100-300 m, 1.5-3.5 m high, top width being 1 to 2 m. A spill way is made at proper location to let out excess water. An outlet is also provided at the lowest point to facilitate removal of excessive water from *khadin* before sowing time. Stored water recharges water table in *khadin* and keeps the subsoil moist, and continuously supplies moisture to deep roots of the crop.

The *khadin* soils remain wet and moist for a long time and progressively gets enriched with fresh fertile soil deposition, relatively high organic nutrient contents than the other arid soils. Due to sufficient moisture inside and around *khadin* area there is a dense and tall natural vegetation growth just like oases in the desert. A *khadin* bund is carefully designed to withstand flood waters. A minimum of 1:15 ratio of *khadin* basin to catchment area is necessary in order to have efficient agriculture. A rocky

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catchment area of 100 hectares can drain 1,00,000 cubic meters of water during a good monsoon year. Some *khadins* are so designed that even a total precipitation of 75 to 100mm fills them to a depth of 50 to120 cm. Wells are dug outside the *khadin* bund in order to flush out the salts that buildup periodically in the soil.

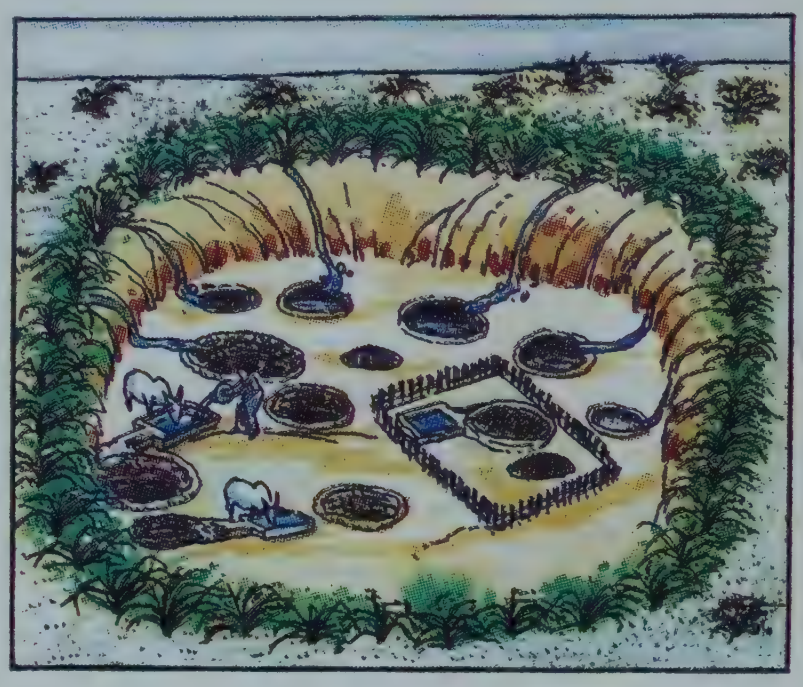
Uses: Mainly used for irrigation.

Location: *Khadins* (also called *Dhoras*) are located in Jodhpur, Barmer, Bikaner, Jaisalmer regions of Rajasthan.

Threats: *Khadins* are deteriorating due to many factors like the fading art of *khadin* construction, increasing soil salinity, breaching & cracking of *khadin* bunds leading to loss of accumulated water, siltation of the *khadin* lands as result of degraded catchments, population increase, continuous fragmentation of landholdings due to the disintegration of traditional joint family households, and improper maintenance, management and collective cooperation.

Virda

Regional Characteristics: This traditional system is practiced in low-lying areas of arid grasslands where the rainfall is scanty (about 317mm per annum) and low ground water table which is salty. *Virda* is a ground water and rainwater harvesting system.



Structure: *Virdas* are shallow wells dugout in low depression called *jheels* surrounded by *Prosopis juliflora* trees and native grasses at the periphery. This vegetation checks soil erosion and siltation. Rainwater flowing through several small channels is collected here. The infiltrating rainwater gets collected at a level above the salty ground water because of its low density. To harvest the upper sweet water, many *virdas* are dug in the upper layer of accumulated rainwater upto a depth of 1m above the ground water. There exists a transition zone of brackish water between these two layers of sweet and saline waters. As the fresh water is removed, the brackish water moves upwards and accumulates towards the bottom of the well. Near *virdas*, small clay troughs are made to provide drinking water for cattle.

Management: Sufficient grass cover is necessary to facilitate maximum infiltration of fresh water and also to check siltation.

The maintenance of natural vegetation and optimum number of animals are necessary for smooth functioning of *virdas*.

Uses: The stored rain water in a *virda* is used for drinking purpose.

Location: Maldhari nomadic tribe who inhabit the Banni grasslands in the desert areas of northern Kutch district of Gujarat.

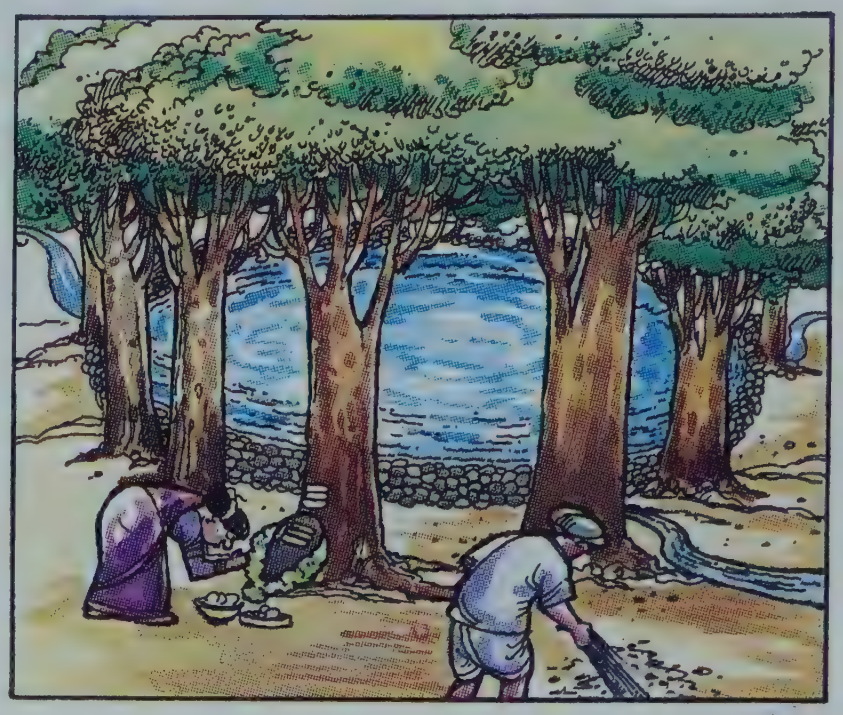
Threats: Drinking water supply, uncontrolled propagation of *Prosopis juliflora* trees have resulted in shrinking grasslands. Intense soil compaction due to replacement of native cattle breeds with heavy hoofed exotic breeds has resulted in reduced water infiltration. Sea water intrusion has led to alarming levels of degradation of *virdas* in many coastal parts of Kutch.

Naula

Regional features: This type of water harvesting system is found in hilly regions with an average annual rainfall of about 1950 mm and having subterranean springs. *Naula* is a very old method of harvesting ground water from the springs.

Structure: *Naula* or *hauzi* is a stone lined percolation tank or pond made of a stone wall built across a stream or spring. There may be 2 or more *naulas* depending on available water resources and village population. Separate *naulas* are constructed

for cattle. *Naulas* are surrounded by huge shady trees to prevent evaporation. It is kept clean and tidy. Trees surrounding *naula* especially native oak and rhododendron help in water percolation, control soil erosion and maintain its cleanliness of water.



Management: People worship *naula* and trees surrounding the *naula*. Leaves of medicinal plants and fruits like amla are added to purify *naula* water.

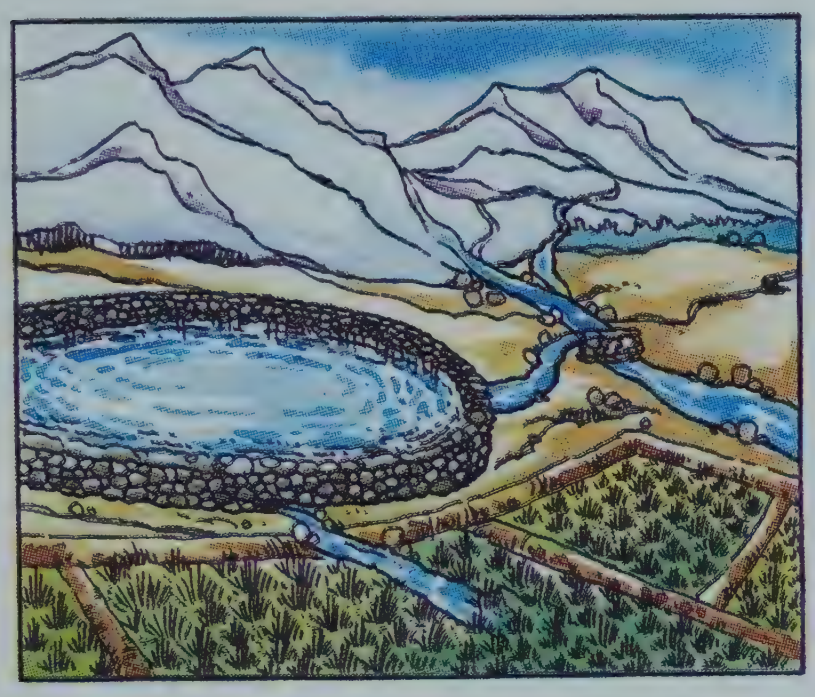
Uses: *Naulas* were the only source of drinking water in some thickly populated areas before pipe water supply.

Location: *Naula* system is commonly practiced in hilly areas of Kumaon, Garhwal, Uttarakhand regions of Uttar Pradesh.

Threats: Almost 95% of *naulas* and their supporting springs are affected by growing population, deforestation, developmental activities like road construction. Replacement of native oak & rhododendron trees with pine plantations has led to rapid degradation of *naulas.*

Zing

Regional characteristics: This system is found in cold arid regions where the mean temperature is -10°C in winter and 20°C in summer and average annual precipitation of about 140mm, concentrated only in the winter in the form snow. This is a glacial water harvesting system.



Structure: Surface water from the melting snow and glaciers on the mountain, flows in the form of streams. The flow is considerably greater in late summer (July to August). These glacial water is diverted from the streams through channels and it is stored in a small tank called *zing*. The stored water is used to irrigate the crops on the following day. Each village has large network of canals and *zings*.

Management: To ensure equitable distribution of the scarce water resource, the villagers elect a water official known as *churpun*. The *churpun* ensures that all the fields are adequately irrigated and no field is left unirrigated. Construction, repair and maintenance of *zings* is taken up by the community. To keep the water clean, activities like washing clothes are strictly prohibited near the streams. Streams are worshipped by the people.

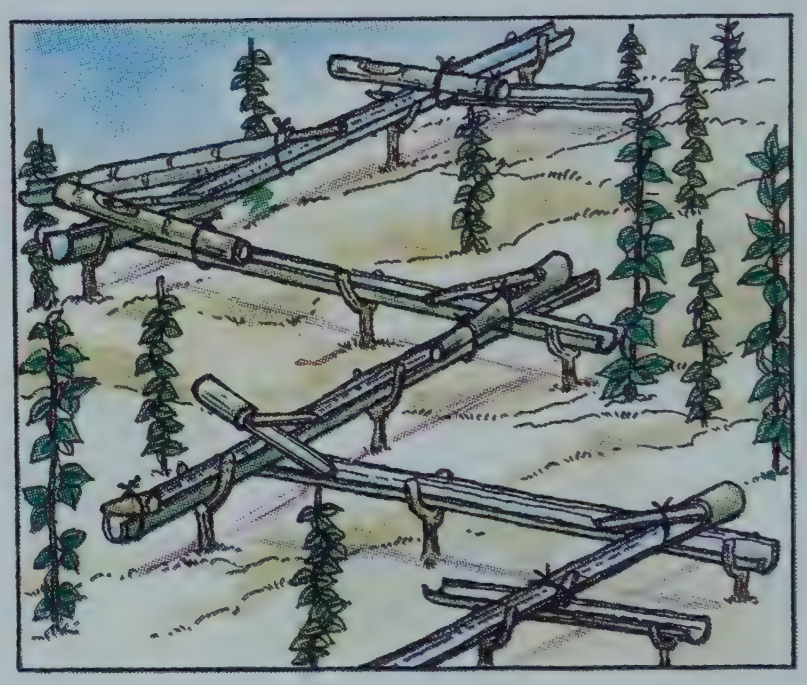
Uses: Mainly used for irrigation.

Location: Ladakh and Leh regions in Jammu and Kashmir.

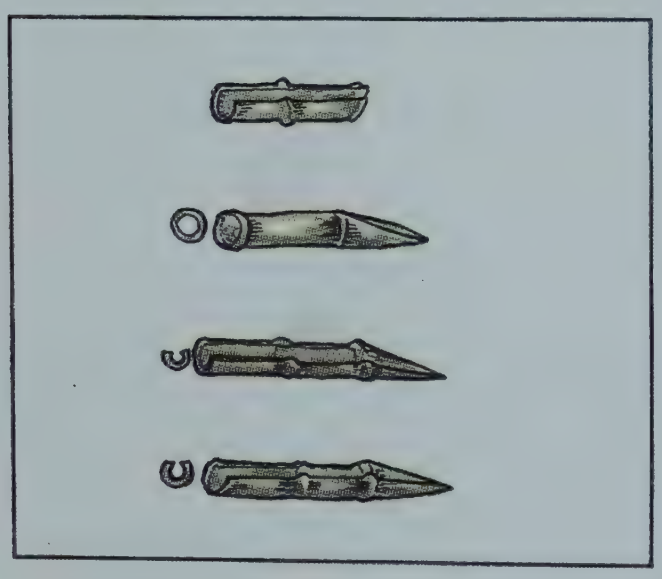
Threats: Pollution due to urbanisation especially in Leh area.

Bamboo Drip system

Regional Characteristics: This type of water harvesting system is prevalent in hilly regions with rainfall ranging from 2000 mm to 2,500 mm, having abundant ground and surface water resources. This system is about 200 years old method of tapping groundwater and surface water using bamboo pipes.



Structure: Tribes in Meghalaya harvest water from hill streams or springs through bamboo pipes to irrigate betel leaf, black pepper and areca-nut plantations on steep slopes with this water. With a network of bamboo pipes of different diameters, length and shapes, 18 to 20 liters of water are diverted per minute from the main channel using bamboo channels with bigger diameter. The flow rate at the plant root zone is



controlled to about 20 to 80 drops per minute using bamboo pipes with smaller diameter.

Management: Farmers take care of the repair and maintenance of pipes and supports. In this system long lasting, cheap local materials are used which can be easily dismantled and reconstructed when required. More importantly, it helps in efficient utilization and water leading to conservation.

Uses: Used for irrigation, sometimes for drinking and other domestic purposes.

Location: Tribal pockets of Khasia and Jaintia hills of Chirapunji - Mawsynram belt of Meghalaya in North East.

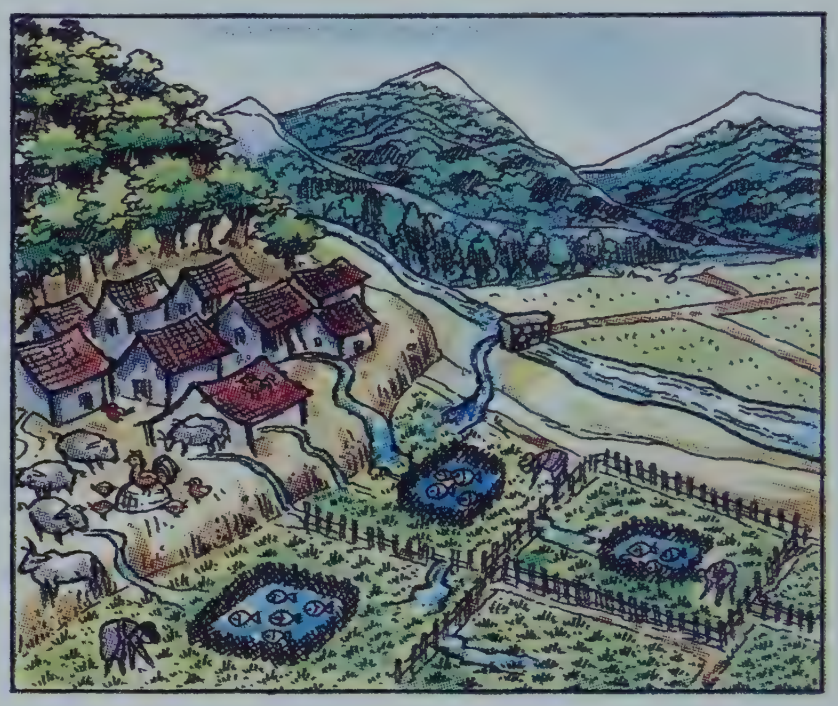
Threats: At the moment there is no specific threat to this system. Farmers prefer to use their traditional form of bamboo drip irrigation instead of modern drip systems which are complex, and costly to maintain and install.

Apatani System

Regional Characteristics: This is a wet rice cultivation cum fish farming system practiced in elevated regions of about 1600m and gentle sloping valleys, having an average annual rainfall about 1700mm and also rich water resources like springs and streams. This system harvests both ground and surface water for irrigation.

Structure: In *Apatani* system, valleys are terraced into plots separated by 0.6 meters high earthen dams supported by bamboo

frames. All plots have inlet and outlet on opposite sides. The inlet of low lying plot functions as an outlet of the high lying plot. Deeper channels connect the inlet point to outlet point. The terraced plot can be flooded or drained off with water by opening and blocking the inlets and outlets as and when required.



The stream water is tapped by constructing a wall of 2-4 m high and 1 m thick near forested hill slopes. This is conveyed to agricultural fields through a channel network. A few channels are linked to the village drainage system in order to drain domestic sewage, human, pig and poultry wastes. This is said to enhance water nutrients favoring rice cultivation.

Fish farming is carried out in vertical pits with protected bamboo mesh in middle of paddy fields. Fishlings are introduced a week before the paddy transplantation and harvested before paddy harvesting.

Management: Maintenance and improvement of this system is carried out by the farmers under the supervision of the village chief.

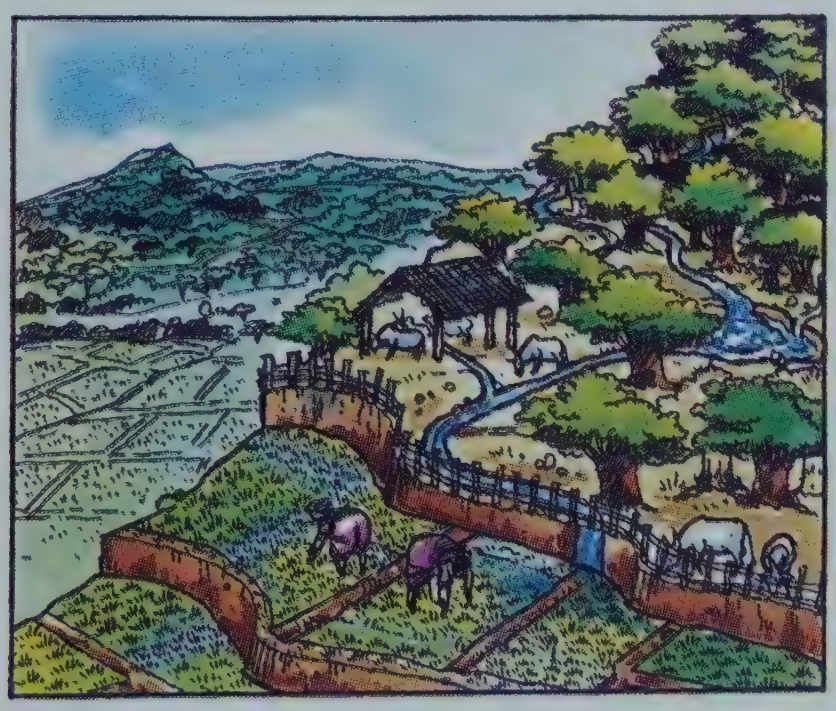
Uses: Water is used mainly for irrigation. In this system paddy yield is about 3.5 to 4.1 tonnes per hectare with very less organic fertilizer input. Fish production is approximately 50kg/ha.

Location: Practiced by *Apatani* tribes of ziro in the lower Subansiri district of Arunachal Pradesh.

Threats: Currently, there seems to be no threat to this system due to effective management and farmers' cooperation. However, problems like population growth, fragmentation of agricultural lands and deforestation on the hill slopes could prove detrimental to the efficient functioning of the system.

Zabo system

Regional characteristics: This type of water harvesting system practiced in regions with an average annual rainfall (1600mm), deep soils of low moisture retentivity and forested steep slopes. This system harvests ground water and rainwater.



Structure: *Zabo* method of cultivation is also locally known as *nuza* cultivation. *Zabo* means impounding water. This is more than 700 year old traditional practice which is a combination of forestry, agriculture and animal husbandry.

TRADITIONAL WATER HARVESTING SYSTEMS

About 1.5 ha or more land is maintained as natural forest on the hill top, this serves as steep sloped catchment helping to drain spring and rain water. The vegetation helps in water percolation and, check run off and soil erosion during monsoon. Water drained from forest catchment is collected in the ponds measuring 24m X 10m X 2m. These ponds are preceded by 2 or more small silt ponds which clear the silt carried down by the water. The ponds act as reservoirs for irrigating the paddy fields.

About 20 to 30 cows or buffaloes are kept in a fenced cattle yard near the water harvesting pond by each farmer on rotation basis. The cow dung, urine and cattle shed flushing too are drained into the channels coming from pond to increase the nutrient quality of the water - excellent fertilizer for rice cultivation.

A series of paddy fields of 0.2 to 0.5 ha are present at a lower level than water harvesting pond. The water from the ponds along with cattle wastes is fed to the paddy fields through a channel. Some farmers also practice fish farming in their paddy fields

Management: This system functions by combined efforts of the village community for its maintenance.

Uses: Mainly for irrigation. Advantages of this system include high paddy yield of 3 to 4 tonnes per hectare with just two times irrigation. Fish output is about 50 - 60 kg/ha.

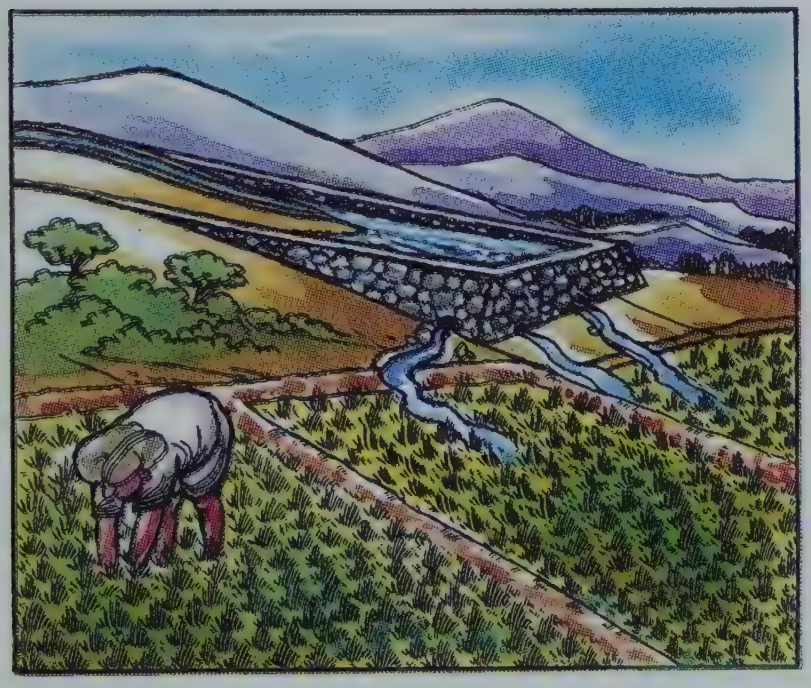
Location: This system is practiced by the Chakhesang tribes in Kirkuma village of Nagaland.

Threats: This system also seem to be facing no threat. The system functions efficiently due to efficient management and

farmers cooperation. Potential problems like deforestation on the hill slopes, soil erosion, population growth and fragmentation of agricultural lands could badly affect *zabo* system.

Ahar - Pyne system

Regional Characteristics : This system is practiced in semiarid regions where the terrain slopes at the rate of about roughly 1 metre per kilometre and has natural depressions. And also in regions having deep ground water table, very low water holding soil types, rapid runoff and seasonal rivers having water in monsoon season. This system is more than 2000 years old, harvests surface water and rain water.



Structure: An *ahar* is built by erecting a masonry embankment (or mud / stone) of 1-2m in height. From the extremes of this bund, two other embankments are constructed so as to project towards higher ground gradually decreasing in height as the ground level rises and ultimately ending at ground level. Thus an *ahar* system resembles a rectangular basin with embankments on three sides. These embankments are provided with several clay tube like outlets called *bhaos*. Unlike tanks, *ahars* are not dug out structures. There are *ahars* with embankments as long as 1 km irrigating about 400 hectares.

In order to prevent rapid runoff and percolation of rainwater during monsoon, a system of *pynes* (channels) is constructed to drain water from the streams into *ahars* and later supplied to surrounding agricultural fields. Some of the *pynes* extend even upto 22 - 30 km.

Management: Maintenance and repairs of ahars were attended to by tenants and farmers under supervision of Zamindar during pre-independence. However, many *ahar* systems are now taken care of by the government after independence.

Uses: Used mainly for irrigation. Benefits derived from an *ahar-pyne* system include growing of two or more crops in a year, flood and soil erosion control in addition to recharging of ground water table and wells.

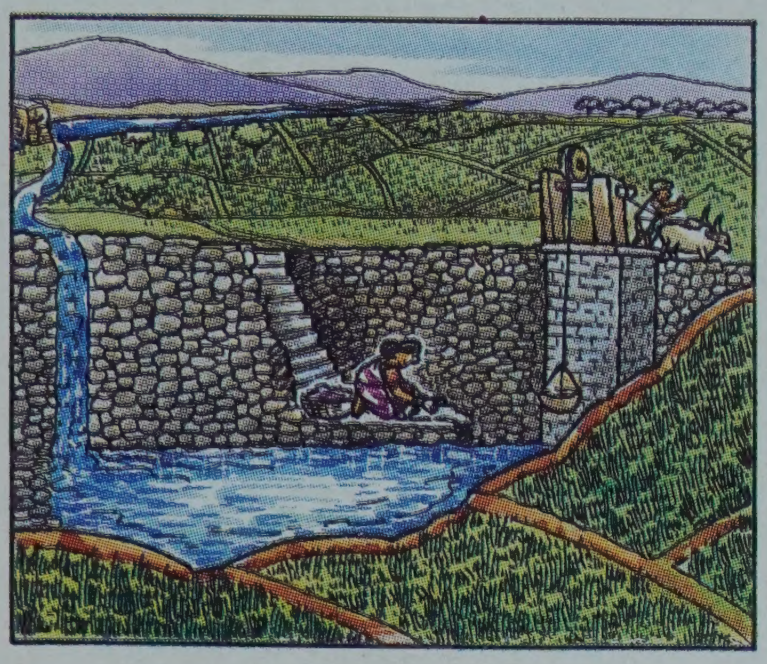
Location: Many parts of southern Bihar and West Bengal.

Threats: The *ahar - pyne* systems in recent times are gravely affected by problems like siltation, land encroachments in the catchment, lack of cooperation and inadequate financial support for maintenance by both government and the people.

Some more minor water harvesting systems practiced in the Palar river basin of South India

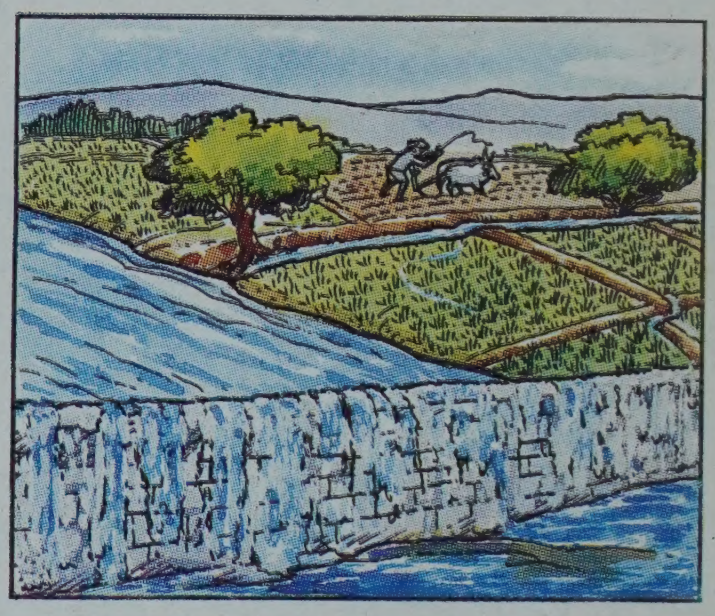
The Palar river basin covers Kolar (Karnataka), Chittoor (Andhra Pradesh) and North Arcot and Chengalpattu districts of Tamil nadu. The average annual rainfall in the Palar basin is 750mm, unevenly distributed and frequently drought prone. About 70% of the cultivated lands are rainfed. However, people have developed many types of water harvesting systems popularly known as "Palar systems", to harvest rainwater and surface water.

Revu



This was a system of collecting surface water and ground water. A small checkdam made of stone, clay and grass is constructed to divert water into a nearby well through a connecting channel. The water stored in the well is lifted by *kapila*, a bullock drawn leather vessel or a drum. Traditionally *revu* was used for irrigation and washing clothes by Dhobis.

Oddu



This system harvests surface water derived from a stream or a river. *Oddu* is an embankment built of stone, cement or lime. It is constructed across a stream or river to raise the water level and to divert to the agricultural fields. The rate of water flow in the stream or river determines the height of *oddu*. Water is mainly used for irrigation.

Kunta

This is a type of percolation tank harvesting rainwater. It helps in recharging ground water table and flood control. *Kunta* provides drinking water for cattle, washing clothes and domestic purposes.

Dona

This is a rainwater harvesting system found in areas with rocky substratum. The rain water is collected and stored in natural depressions on the rocks. This structure may have little or no masonry. *Donas* provides drinking water for cattle and for washing clothes.

These systems are gradually declining in numbers nowadays. Factors like siltation of tanks, excessive runoff, reduction in stream flow, priority to wells and tube wells and mismanagement due to lack of peoples' attention has led to their decline.

Concluding notes

Traditional water harvesting systems are low cost, easily manageable, easily kept in operational condition and environment friendly systems, unlike the modern water harvesting systems that demand high monetary cost, technical expertise, government managed and function against the basic ecological principles. Traditional water harvesting systems have been severely eroded, thrown into disuse and eliminated in many parts of the country. There is an urgent need for good documentation and understanding of traditional water harvesting systems as they have been perfected since time immemorial and can be adopted with very little technical modifications to suit the present conditions.

Serious steps are necessary to revive the traditional water harvesting systems to cater to growing demand of water. Practice of localized traditional water harvesting systems which try to conserve every drop of water should be encouraged.

Source Materials

1. Sustainable Biodiversity Conservation in Indigenous systems — A Project being undertaken by CEE
2. Dying Wisdom, State of India's Environment — A Citizen's Report. Edited by Anil Agarwal & Sunita Narain, An Centre for Science and Environment publication.

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